# MAGLEV Frequently Asked Questions

**(Materials excerpted and adapted from the *Impacts of the Transrapid Magnetic Levitation Train on Human Health and the Environment*, Kilpatrick Stockton LLP, May 2000 included as Appendix C in the *Final Programmatic Environmental Impact Statement, Maglev Deployment Program*, Federal Railroad Administration, 2000; and California-Nevada Super Speed Train Commission)**

## 1. When will construction start?

Not earlier than 2005.

## 2. What does the track look like?

The Maglev does not run on a conventional train track. It runs on a guideway. There are two types of guideways: at-grade and elevated. Figure 1 displays both configurations. The at-grade guideway rests on columns or braces that lift the guideway at least 4 feet from the ground and are set at least 9 feet apart. The elevated guideway rests on columns that can be as much as 65 feet high and 400 feet apart.

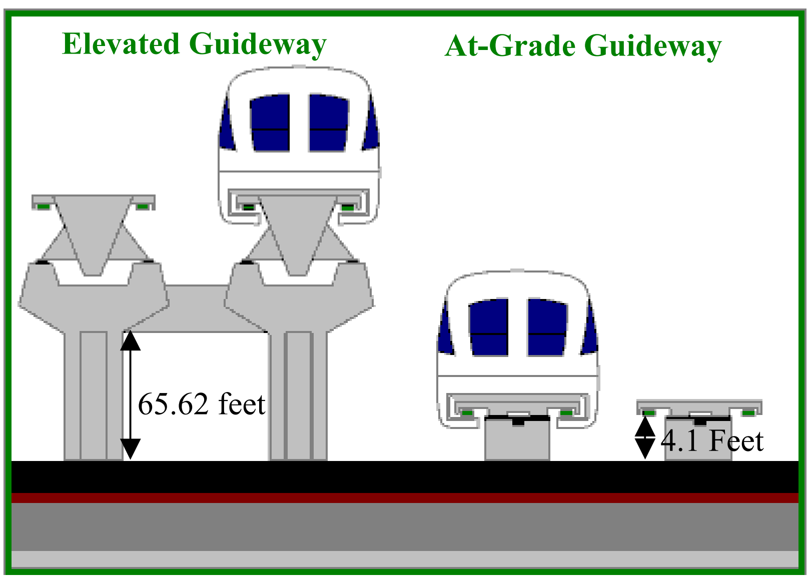


**Figure 1: Typical Guideway Cross Sections**

## 3. How long is each train?

There are two types of train car sections: end and middle. The train will be made up of two end sections and up to eight middle sections. Figure 2 displays the length of each type of car.

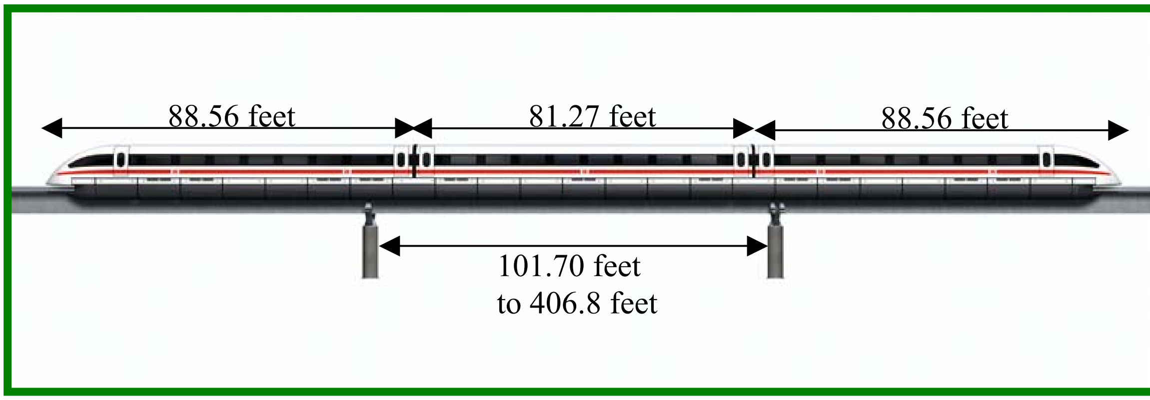


**Figure 2: Lengths of Train Cars and Distance Between Columns**

## 4. How many passengers will the Maglev carry?

The end sections carry 92 passengers in seats and two wheelchairs. The middle sections carry 126 passengers. A 10 section train could carry as many as 1,184 people in seats and four people in wheelchairs.

## 5. What will it cost to ride the Maglev?

Final decisions on fares have not been made. Market demand studies were completed in 1999 and some assumptions about fares were made. The fare between Anaheim or Ontario and Las Vegas was assumed to be $85.00 round trip. The fare between Barstow and Las Vegas was assumed to be $48.50 round trip, and between Primm and Las Vegas $12.00. There were no questions about intra-California trips, about trips to and from Victorville, or about the potential for discounted fares with monthly passes.

## 6. How fast does the Maglev go?

The Maglev train travels at speeds up to 300 mph and can accelerate from zero to 200 mph in three miles. A trip from Las Vegas to Barstow, California, would take 56 minutes and passengers could get from Las Vegas to Anaheim, California, in 96 minutes. While conventional trains operate best on grades less than 2 percent, the Maglev can operate at grades up to 10 percent, which means fewer roadcuts and tunnels are necessary.

## 7. How does it work?

The Maglev train does not have wheels and does not roll. Instead, the train hovers above the elevated track, called the guideway, and is propelled by magnetic force. There is no physical contact between the train and the guideway, so there is very little friction and the possibility for high speeds. The train body wraps around the guideway and is kept in place using the attractive force of individually controlled magnets.

## 8. Who drives the train?

The vehicle operates automatically, so, theoretically, no driver is necessary. In practice, it is planned that an onboard operator would monitor all vehicle functions via the operator console and would be available to help during unscheduled situations.

## 9. What, if any, are the health effects associated with the electromagnetic fields (EMF) that the Transrapid magnetic levitation train (Maglev) generates?

The low-energy magnetic fields associated with Maglev are highly complex and are unlike magnetic fields generated by other man-made devices. FRA and others have funded a considerable amount of research on whether these fields pose potential health risks to humans. Field and laboratory studies have concluded that there is no evidence of adverse biological effects.

## 10. How much noise does the Maglev make?

The noise measurements of the Maglev version 07 are less than those of every type of train tested including a normal freight train, a regional express train, an intercity train, and high-speed trains. Because most of the noise is caused by the flow of air around the front of the train and through the gap between the bottom of the vehicle and the top of the guideway, only at the highest speeds of 250 to 300 miles per hour and at relatively close distances to the most noise sensitive areas would Maglev noises have a “severe impact” on neighbors. Homes, schools, hotels, houses of worship, and parks could be protected from the noise by a combination of physical sound barriers, slowing the train in these areas, and routing the train away from such areas.

Further front-end redesign for the version 08 is expected to have made the train quieter still. Test results are expected in the near future.

## 11. Is it possible to feel the vibrations from passing trains?

Even though the Maglev does not touch the guideway, it can cause vibrations. The extent of these effects varies with the distance from the guideway. For instance, when the train is traveling at 250 miles per hour, vibrations are not noticeable beyond 200 feet from the guideway. At 155 miles per hour, the distance drops to 115 feet.

## 12. Wouldn’t a train passing that quickly be startling to those nearby?

There is a “startle effect” under certain conditions, particularly for people close to the guideway. Startle effects are expected to be similar to those of low flying aircraft. Vehicle drivers on parallel roadways will have a view of enough of the corridor and enough distance from the guideway to ensure that the train will be seen before it is heard and, therefore, that they will not be startled. It is expected that people living and working near the guideway will become accustomed to the train’s passing.

## 13. What effect would the system have on air quality?

There are several types of air quality effects:

- Particulates and emissions associated with the movements of construction equipment;
- Emissions associated with the stations and maintenance facilities;
- Reduction of emissions associated with vehicles now used to make Maglev trips; and

- Emissions of power plants used to generate the electricity needed to run the Maglev.

Construction effects can be minimized by reducing the idling time of construction equipment and by stabilizing the soil using water or soil tackifiers. Emissions associated with stations and maintenance facilities are expected to be minimal, particularly when these facilities are designed to reduce traffic impacts. Recent studies estimating energy consumed per passenger mile traveled have shown the Maglev to be a much more efficient mode of travel than automobiles, buses or airplanes. Emissions associated with the electricity needed to run the Maglev will vary depending upon the fuel used in the power plant(s). The sum of these effects will be studied as a part of this analysis and succeeding NEPA/CEQA studies.

## 14. Is the Maglev safe to ride in?

The Maglev's safety features have been extensively tested at a full-scale test track in Emsland, Germany. It is expected that passengers are less likely to be killed or injured on this train than they would be on any form of mechanized transportation. Figure 3 displays the guideway and train.

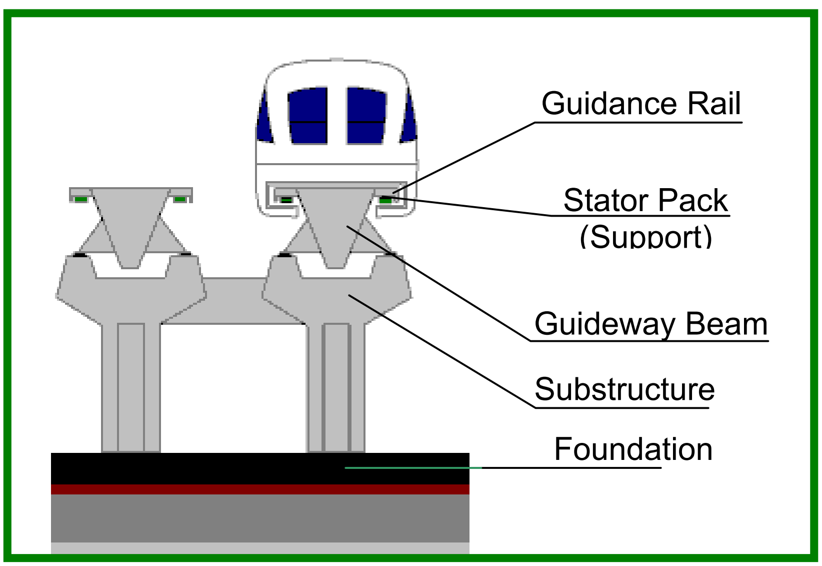


**Figure 3: Guideway Elements**

Safety is achieved in several ways.

- The train must be able to achieve a "safe hover" so that, under any circumstance, it can come to a stop at a location on the guideway where passengers can be safely evacuated. Each magnet on guideway has an individual control system with redundant gap sensors to assure that the required distance between the train and the guideway is maintained at all times.
- The train itself carries batteries with sufficient power to ensure the train can slow down, lower onto mechanical skids, and glide to a stop even if the guideway power fails.
- As displayed on Figure 3, the bottom of the train wraps around the guideway, so it cannot derail.

- The guideway is grade-separated from all other traffic, so collisions with other types of vehicles is not possible. See Figures 1 and 2 for the range of possible guideway configurations.
- The guideway can only operate in one direction, so a head-on collision with another Maglev train is not possible.
- The guideway is protected against the intrusion of obstacles into the vehicle's path by such protective measures as barriers.

## 15. What about an earthquake? Is the Maglev safe then?

Current seismic design standards will be incorporated to withstand seismic ground shaking that would result from a maximum creditable earthquake. The effectiveness of these measures had been demonstrated by similar structures in recent earthquakes in Japan and California. The train car is designed to be crashworthy in the event that it should be involved in a collision. The nose area of the train is reinforced, shaped to deflect most guideway obstructions aside, and has a crush zone to absorb larger collisions without subjecting the passengers to a dangerous situation. Disruption of guideway continuity would trigger the same safety mechanisms that are detailed in question #14 above.

## 16. What are the potential effects on habitat and human land use?

The Maglev guideway offers more flexibility than other surface transportation systems. The braces or columns supporting the guideway cover a small proportion of the ground underneath, so that habitat, wetlands, agricultural lands, floodways, and many land uses can continue with little or no disruption. See Figures 1 and 2 for the range of possible guideway configurations. Conventional trains are most efficient at grades of 2 percent or less. Maglev can climb 10 percent grades without degrading efficiency. This means a reduction in the amount of grading required.

Guideway configurations also allow for spanning roadways, conventional rail, floodplains, wetlands, habitats, agricultural lands, and developed areas to ensure that traffic, rivers, flood control facilities, sensitive lands, and many existing land uses can function normally. Combined with variable heights, curve radii achievable at the slower speeds planned for urbanized areas will allow the guideway to "thread" around elevated freeway interchanges and tall buildings, and away from sensitive land uses. One land acquisition strategy would acquire ten-foot-square pads for each of the columns and air rights for the guideway, leaving the remainder of the land under the guideway for existing and compatible uses.

The distances required to achieve the speeds that make this technology unique argue for stations that are relatively few and far between. Unlike highways that can promote urban sprawl along their entire length, Maglev stations can be used to attract concentrated residential and commercial development in much the same way that conventional commuter rail stations do. Stations proposed for Victorville, Ontario and Anaheim can be expected to function as part of the Southern California regional mass transportation system, particularly as they access intermodel transfer facilities. Connections with other forms of mass transportation at intermodal transfer facilities – Metrolink, express and local bus, automobile, and conventional rail – may serve to maximize the Maglev's effectiveness as a regional transportation system.

## 17. Wouldn't the Maglev block views?

In some areas it will. There are two types of visibility blockages.

- The train, the guideway, and its supports can come between the viewer and the scenery. In open areas of the corridor, the obstruction is minimal except for those few seconds during which the train passes. In developed areas, the facilities will obstruct views from particular angles.
- In an effort to reduce the noise, walls constructed between the guideway and neighboring noise-sensitive uses will obstruct the views from and of those uses. For example, the wall could block views of signs for businesses along the route or of the mountains from nearby homes.

These effects will be studied throughout the design and environmental documentation processes.

## 18. What happens during construction?

As discussed above there will be some fugitive dust and increased vehicular emissions from the construction activities and vehicles. Most of the guideway construction is done in a manufacturing plant. Pieces are brought to the construction site and set in place there. It is likely that only the footings for the braces and columns would be poured on site. Construction vehicles would include digging equipment; cranes to set the braces, columns, and guideway; and cement mixers.

Other things that can be expected to happen include the following:

- Temporary closings of intersecting streets while the guideway is being set in place between columns;
- Raising of intersecting power lines above Maglev operating envelope.
- Short term interruptions of intersecting and abutting rail service.
- Noise and vibration from heavy machinery and trucks.
- Because of the intense summer heat, mobile emergency services that travel with the project construction team and a rigorous safety plan will be necessary to protect construction workers in those segments of the alignment that pass through unpopulated areas far from emergency services.

Since the height and distance between columns can be varied to accommodate underground utilities, freeway interchanges, low-rise buildings, and other existing facilities, it is not expected that many utility lines or buildings would be relocated to accommodate the guideway.

## 19. What is the history of the project?

1981 - Project Inception
1982 - Phase I Feasibility Study
1987 - Phase II Feasibility Study
1988 - California-Nevada Super Speed Train Commission Formed
1991 - Turnkey RFP Issued Bechtel/C. Itoh Receive Franchise
1997 - American Magline Group Agreement

1998 - TEA 21 Legislation Includes $1 Billion for Maglev Project Implementation
February 29, 2000 - Environmental Assessment for Demonstration Segment – Primm to Las Vegas – Complete
June 30, 2000 - Project Description Complete

## 20. Where can I learn more?

There are several interesting documents on the web. The Programmatic Environmental Impact Statement for the FRA Maglev Deployment is at http://www.fra.dot.gov/s/env/maglev/MagPEIS.htm. Appendix C is *Impacts of the Transrapid Magnetic Levitation Train on Human Health and the Environment*, Kilpatrick Stockton LLP, May 2000, from which much of this material is drawn.